

What is Claimed Is:

1. A fuel cell characterized by having a pure water channel comprising polymers, wherein one end of the polymer chains are connected to a surface of said pure water channel, and said polymer chains can form an entanglement among themselves.

2. The fuel cell of Claim 1 is characterized by a structure that the flow of pure water in the said pure water channel is stopped when the fuel cell is shut down, and pure water flows in the said pure water channel when the said fuel cell is operated, and the said polymer entanglement is broken up by the flow of pure water

3. The fuel cell of Claims 1 or 2 wherein said polymer chain is hydrophilic.

4. The fuel cell of Claim 3 wherein said polymer chain has a principal chain that is a continuous alkyl base, or a co-polymer whose principal chain is a continuous alkyl base.

5. The fuel cell of Claim 1 wherein said polymers are a thermo-responsive and undergo a volume phase transition in accordance with the temperature of the pure water.

6. The fuel cell of Claim 5 wherein said thermo-responsive polymers contract in water at temperatures of 40°C or higher, and expand in water at temperatures of 20°C or lower.

7. The fuel cell of Claim 6 wherein said polymer chain is N-isopropyl acrylamide, or an N-isopropyl acrylamide co-polymer.

8. A fuel cell characterized by having a pure water channel and a means for discharging the water in the pure water channel to outside of the fuel cell when the fuel cell is shut down.

9. The fuel cell of Claim 8 further characterized by means for measuring at least one of either the flow rate of pure water flowing through the pure water channel of the fuel cell system or the pressure of the pure water, and means for controlling said at least one of either the flow rate of the said pure water or the pressure of the said pure water to a level that does not exceed a predetermined range.

10. A method of operating a fuel cell having a water channel with a polymeric material contained therein, the method comprising:

permitting water to flow through the channel when operating the cell; and
holding water in the polymeric material when the cell is not operating.